芽|Sprouts Working Papers on Information Systems ISSN 1535-6078

Complementarity, Relation-Specific Investment, and Opportunism: Explaining Asymmetric Governance Modes in Hub-and-Spoke Networks within the Enterprise Application Software Industry

Thomas Kude
University of Mannheim, Germany

Jens Dibbern
University of Mannheim, Germany

Armin Heinzl
University of Mannheim, Germany

Abstract
In the enterprise application software industry, dominant system vendors (hubs) have formed strategic partnerships with small software companies (spokes), resulting in the emergence of hub-and-spoke networks. Based upon the concept of software stacks, we argue that the governance mechanisms applied by hub and spokes depend on the complementarity between hub's and spoke's resources. Specifically, we draw on the relational view and combine it with the resource dependence theory to develop a theoretical framework that explains the link between the type of complementarity and differential governance mechanisms. We are able to show that while hubs seek to take advantage of complementarities with the entire network of partners, spokes are primarily interested in gaining access to complementary resources and capabilities of the hub organization. In order to leverage the benefits of resource complementarity, hubs mainly invest in network-specific resources to generate value. On the contrary, the spokes' investments are hub-specific. Accordingly, hubs only face minor threats of opportunistic behavior on the part of a specific spoke, whereas the spokes' existence is endangered by the threat of opportunistic behavior by the hub. Due to these three asymmetries, hubs apply formal governance mechanisms in order to efficiently coordinate the network of spokes, whereas spokes rely on informal governance mechanisms.

Keywords: Relational View, Resource Dependence Theory, Power Imbalance, Modularity, Service-Oriented Architecture, Software Stack

Permanent URL: http://sprouts.aisnet.org/8-25

Reference: Kude, T., Jens, D., Armin, H. (2008). "Complementarity, Relation-Specific Investment, and Opportunism: Explaining Asymmetric Governance Modes in Hub-and-Spoke Networks within the Enterprise Application Software Industry," Proceedings > Proceedings of JAIS Theory Development Workshop . *Sprouts: Working Papers on Information Systems*, 8(25). http://sprouts.aisnet.org/8-25

Complementarity, Relation-Specific Investment, and Opportunism: Explaining Asymmetric Governance Modes in Hub-and-Spoke Networks within the Enterprise Application Software Industry

Thomas Kude, Jens Dibbern, and Armin Heinzl

University of Mannheim, Department of Information Systems
kude|dibbern|heinzl@uni-mannheim.de

Abstract

In the enterprise application software industry, dominant system vendors (hubs) have formed strategic partnerships with small software companies (spokes), resulting in the emergence of hub-and-spoke networks. Based upon the concept of software stacks, we argue that the governance mechanisms applied by hub and spokes depend on the complementarity between hub's and spoke's resources. Specifically, we draw on the relational view and combine it with the resource dependence theory to develop a theoretical framework that explains the link between the type of complementarity and differential governance mechanisms. We are able to show that while hubs seek to take advantage of complementarities with the entire network of partners, spokes are primarily interested in gaining access to complementary resources and capabilities of the hub organization. In order to leverage the benefits of resource complementarity, hubs mainly invest in network-specific resources to generate value. On the contrary, the spokes' investments are hub-specific. Accordingly, hubs only face minor threats of opportunistic behavior on the part of a specific spoke, whereas the spokes' existence is endangered by the threat of opportunistic behavior by the hub. Due to these three asymmetries, hubs apply formal governance mechanisms in order to efficiently coordinate the network of spokes, whereas spokes rely on informal governance mechanisms.

Keywords: Relational View, Resource Dependence Theory, Power Imbalance, Modularity, Service-Oriented Architecture, Software Stack

Introduction

The structure of the enterprise application software (EAS) industry has been undergoing significant changes during the last decades. While early systems were custom-developed in a make-to-order fashion, in the 1970s, standardized, monolithic systems that covered the majority of the business processes of a variety of customers emerged and became the state-of-the-art during the 1980s. This turned the formerly diverse industry into an oligopolistic structure with a few dominating major system vendors (Campbell-Kelly, 2003).

In recent years, however, this trend has been countervailed by a tendency towards disintegration (Bresnahan and Greenstein, 1999, Messerschmitt and Szyperski, 2003). Facilitated by the emergence of standards and middleware technologies, like e.g. service-oriented architectures, the formerly integrated systems are more and more characterized by a high degree of modularity (Baldwin and Clark, 1997). From a theoretical point of view, it can be argued that the tendency towards disintegrated systems should be mirrored by a higher degree of organizational modularity (Conway, 1968, Hoetker, 2006). However, in spite of the increasing interorganizational division of labor in the EAS industry, a seamless coordination between different organizations and friction-free mixing and matching of software components from different vendors is still a vision. Instead, partnership networks have emerged in which companies of the EAS industry agree to work together closely based on some mutually agreed standards (Gao and Iyer, 2008). Within these partnership networks, a limited number of large organizations, often referred to as hubs, platform leaders or keystones (Gawer and Cusumano, 2002, Iansiti and Levien,

2004, Jarillo, 1988), provide the systems' architecture as well as generic core functionalities, while smaller software companies (referred to as spokes or niche players) build their solutions upon and complement these platforms (Iansiti and Levien, 2004, Prencipe, 2003). The compatibility and functionality of the spokes' solutions is thereby often ensured through a certification of the spokes' products or resources by the hub organization. The spokes represent independent legal entities that, unlike in supplier networks (e.g. in the automotive sector), sell their solutions directly to the market. Moreover, partner networks in the EAS industry are special in that although there is no direct exchange of tradable goods between the hub and the spokes, the networks compete with each other in a system competition that is characterized by network effects (Farrell et al., 1998, Shapiro and Varian, 1999).

We argue that this hub-and-spoke structure may often result in strong imbalance between partners, which in turn raises questions about the long term sustainability of such partnership arrangements. Hubs are generally perceived to be dominant over spokes due to their supremacy regarding assets, investments, market share, profits, as well as resource and revenue dependencies (Bala and Venkatesh, 2007). [1] Bearing in mind this imbalance between hub and spokes, we argue that it is of special theoretical and practical interest to examine governance mechanisms applied in partnerships between dominant and non-dominant firms within partner networks in

[1] In the network structure observed in practice, hybrid forms exist. Some companies represent a spoke in one network, while taking the role of a hub in its own hub-and-spoke network. For instance, IBM and SAP are partners but have both established a network of spokes. In order to properly examine the impact of firm dominance, we focus on partnerships between dominant hubs and small spokes.

the EAS industry. For example, the question is raised how small spoke organizations ensure that dominant hubs will not behave opportunistically, e.g. by substituting or imitating the small organizations' products or by replacing the partner with another firm (i.e. partner). Power imbalance and the ensuing risk of opportunistic behavior call for appropriate governance mechanisms for alleviating partnership risks and for ensuring that the expected benefits of the partnership can be realized.

In order to study differential forms and outcomes of partnerships, previous literature has drawn on the economic theory of complementarities (Milgrom and Roberts, 1995). As such, it has been argued that the success of interorganizational arrangements in the software industry is dependent upon the respective position of the organizations within a software stack that reflects the architecture of the overall system (Gao and Iyer, 2006). Building on existing research, we apply the idea of complementarities between software firms to the special case of the EAS industry. Specifically, we shed more light on the theoretical reasons for value creation through inter-firm complementarity in the EAS industry. By studying the intermediate role of alternative governance mechanisms as a major prerequisite for achieving successful relationships (Lavie, 2007), we add to previous research that has mainly focused on the direct impact of inter-firm product complementarity on partnership success (Gao and Iyer, 2008).

Taken together, this paper aims at theoretically answering the question of how the type of complementarity between the partners influences the choice of governance mechanisms applied by hub and spoke organizations within the EAS industry in order to leverage the benefits of complementary resource endowments. Our

theoretical analysis builds on the relational view of competitive advantage (Dyer and Singh, 1998) together with the resource-dependence theory (RDT, Pfeffer and Salancik, 1978). Based on these two theoretical lenses a framework is developed that explains how the choice of different governance mechanisms by hub and spoke organizations in the EAS industry is influenced by three types of interrelated asymmetries between hub and spoke. The paper is structured as follows. First, the relational view is introduced. Subsequently, in order to develop our theoretical framework, the theoretical assertions of the relational view are analyzed in the light of relationships between hubs and spokes in the EAS industry. Finally, the framework is discussed and conclusions are drawn.

A Relational View on Hub-and-Spoke Networks

The Relational View of Inter-Organizational Competitive Advantage

In drawing on the resource-based view of the firm (RBV, Barney, 1991, Wernerfelt, 1984) and on transaction cost economics (TCE, Williamson, 1981), the relational view of interorganizational competitive advantage (Dyer and Singh, 1998) holds that firms can create relational rents when entering into partnerships with other firms that provide complementary resources. According to Dyer and Singh, complementary resources are "distinctive resources of alliance partners that collectively generate greater rents than the sum of those obtained from the individual endowments of each partner" (Dyer and Singh, 1998, p. 666f). In order to leverage the potential benefits of complementary resources, firms have to invest in relation-specific assets (Dyer and Singh, 1998). Accordingly, the relationship itself can become the source of a

competitive advantage if in fact it is unique (i.e. specific) and hence hard to imitate or substitute by competitors. This actually extends the key argument of the RBV, which has its primary focus on the internal resources of a firm (Amit and Schoemaker, 1993).

From a TCE perspective, however, increasing asset specificity leads to higher transaction costs, given that organizations that invest in relation-specific assets run the risk of opportunistic behavior on the part of their collaborators (Coase, 1937, Williamson, 1981). While advocates of TCE perceive this as a trade-off and propose integration of transactions into the hierarchical organization as a remedy for transaction costs caused by high asset specificity, Dyer argues that transaction costs "do not necessarily increase with an increase in relation-specific investments" (1997, p. 551). Such a perspective emphasizes transaction value instead of transaction costs and holds that both inter-firm investments in relation-specific assets and transaction cost discrimination are simultaneously feasible (Zajac and Olsen, 1993). More specifically, the central argument of the relational view is that interorganizational competitive advantage can be generated through inter-firm arrangements if the relationships move away from market transactions and, instead, invest in (1) inter-firm relation-specific assets as well as (2) inter-firm knowledge-sharing routines, exploit (3) complementary resource endowments, and apply (4) effective governance mechanisms (Dyer and Singh, 1998). Regarding the persistence of relational rents, Dyer and Singh's (1998) relational view again draws on the RBV of the firm and argues that competitive advantages by definition have to be difficult to imitate.

Several of the mechanisms that help to sustain competitive advantages mentioned by Dyer and Singh can be subsumed under the term "uniqueness of the relationship".[2]

There are indications, however, that entering into unique relationships may not generally be the desired end for both parties of a relationship. For example, Lavie (2007) argues that alliances with dominant firms may promote the creation of value, but make it difficult for non-dominant firms to appropriate the created value. Moreover, the effect of power imbalance on value appropriation is found to increase with the level of bilateral competition between the firms (Lavie, 2007).[3] Lavie's findings of the software industry hint upon the importance of governance mechanisms to create and appropriate value in situations of firm dominance. However, the impact of resource complementarities on governance mechanisms is not explicitly considered.

This paper fills this gap and further analyzes the consequences of the imbalance between hub and spokes in the EAS industry on the alignment between complementarities and governance mechanisms from the perspective of the relational view. In order to do so, we discuss the sources of relational rents and the resulting rent preserving mechanisms in the light of partnerships between dominant and non-

[2] Namely, causal ambiguities, time compression diseconomies, inter-organizational asset interconnectedness, and resource indivisibility prevent competitors from imitating the unique relationships of a focal dyad of companies (Barney, 1991, Dierickx and Cool, 1989). Additionally, Dyer and Singh mention the scarcity of potential partners and the institutional environment as factors that impede an imitation of inter-organizational competitive advantages.

[3] Such a situation of cooperation and competition is sometimes referred to as "co-opetiton" (Nalebuff and Brandenburger, 1997).

dominant organizations in the EAS industry. While Dyer and Singh (1998) present the four sources of relational rents in an unconnected manner, we introduce a chain of reasoning that logically relates the different categories to each other, both from the spokes' and the hubs' perspective. In order to properly examine the alignment of resource complementarities and governance mechanisms, we first focus on inter-firm resource complementarities. Subsequently, investments in relation-specific assets and knowledge-creation that are necessary to benefit from resource complementarities and the resulting threat of opportunistic behavior will be analyzed. Finally, the consequences for governance mechanisms will be discussed.

Generation of Relational Rents in Hub-and-Spoke Networks

Resource Complementarity

While previous research has focused on differences in the degree of complementarity between software firms (Gao and Iyer, 2008), we argue that within hub-and-spoke networks in the EAS industry, different types of complementarities exist. Moreover, complementarity may not only become important on a technological level, but also regarding the commercial and social capital of firms. These different types of complementarities are discussed below in order to subsequently study the consequences for the governance mechanisms applied by hub and spokes.

Spoke Perspective. In order to better understand the notion of complementarity it is instructive to analyze the reasons for why firms enter into partnerships more closely. Several authors have transferred the idea of the RBV on interorganizational arrangements, stating that strategic assets may be accessed though inter-firm

cooperation (Das and Teng, 2000, Eisenhardt and Schoonhoven, 1996, Lavie, 2006). Thereby, especially those firms that suffer from a shortage of certain resources will try to form partnerships or alliances in order to overcome these resource gaps (Eisenhardt and Schoonhoven, 1996). However, in order to access resources through inter-firm collaboration, firms not only have to be willing to fill their own resource gaps, but also have to be attractive as a potential partner themselves, i.e., they have to possess certain resources which their potential collaborator lacks. This "duality of inducements and opportunities" (Ahuja, 2000) is particularly problematic for small and young companies. On the one hand, small and young companies often face what Eisenhardt and Schoonhoven (1996) call "strategic vulnerable positions" and are therefore prone to a lack of resources (Welsh and White, 1981). On the other hand, due to their limited size and often short period of existence, small and young companies will hardly be able to offer significant resources to potential partners, thus reducing the possibilities to overcome their own resource gaps through partnering (Ahuja, 2000, Dierickx and Cool, 1989).

The hub-and-spoke networks that emerged in the EAS industry seem to be a possible way-out of this dilemma. Through their partnerships with a hub, spokes can access external resources and dynamic capabilities (Teece et al., 1997) that the hub disposes of. Ahuja (2000) proposes a taxonomy of strategic resources obtained through interorganizational cooperation that divide the resource endowments of potential partners into technological capital, commercial capital, and social capital. From a technological point of view, hubs provide the architecture that the spokes' solutions are based upon. Innovating this architecture on a regular basis is deemed especially

crucial in a dynamically changing environment like the EAS industry (Henderson and Clark, 1990). Regarding commercial capital, hub companies that usually act on a global scale and have a large installed base of customers offer small spokes the possibility to access markets and marketing channels that would otherwise be unreachable. Furthermore, hubs dispose of social capital that spokes could benefit from in that they improve their own visibility and credibility by making use of the hub's reputation and high profile and encourage hub personnel to recommend and promote the spoke's solution.

Hub Perspective. The hub organization, on the other hand, also benefits from the spokes' strategic resources (Rothaermel, 2001). First and foremost, hubs can exploit the spokes' commercial and social capital to address niche markets they have so far not been able or willing to approach. Regarding technological capital, spokes are assumed to dispose of specific knowledge in these niches and be especially successful in innovating specific modules of the overall system (Henderson and Clark, 1990). However, and central to our reasoning, we argue that due to the spokes' mentioned resource limitations, the hub does not gain competitive advantages from a singular relationship with one specific spoke. Instead, we opine that the hub benefits from the multilateral 1:n-relationship with the network as a whole.

This becomes clear when considering that the main reasons for the emergence of hub-and-spoke networks may be seen in the fact that competition and demand heterogeneity have forced large vendors to give up proprietary approaches in order to gain market share and strive for becoming a *de facto* standard (Schilling and Steensma, 2001, Shapiro and Varian, 1999). Put differently, hubs face a system

competition with rival networks that is characterized by network effects (Farrell et al., 1998, Shapiro and Varian, 1999). Therefore, we argue that hubs prosper in particular if a great number of spokes participates in their network and offers complementary functionalities, a fact that is even reinforced since spoke companies will often not be able to offer solutions for different competing platforms due to resource limitations.

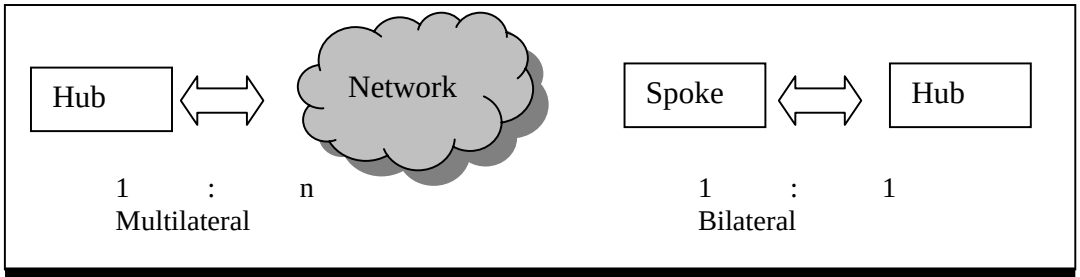

Figure 1: Hub-Network Relationship vs. Spoke-Hub Relationship

To sum up, within the hub-and-spoke networks of the EAS industry, spoke companies aim at accessing the hub's resources, while the hub benefits from the resources provided by the network as a whole. This distinction in value-generating relationships is depicted in Figure 1. While hubs gain value from the network and thus, figuratively, form a multilateral relationship with the network as a whole (left), spokes enter into bilateral 1:1-relationships with the hub (right). This is summarized by the following asymmetry.

Asymmetry 1: In the hub-and-spoke networks of the EAS industry, the combination of complementary resource endowments in a singular hub-spoke relationship only provides significant value to the spoke. Hubs benefit from complementarities with the network as a whole.

Investments in Relation-Specific Assets

The concept of complementary resource endowments of partnering firms suggests a potential value gain through combining resources. However, in order to realize these benefits, firms have to invest in relation-specific assets (Dyer and Singh, 1998). Generally, asset specificity has been defined as the "the degree to which an asset can be redeployed to alternative uses and by alternative users without sacrifice of productive value" (Williamson, 1990, p. 142). Translated to the case of interorganizational relationships, asset specificity refers to the degree to which assets are of low usefulness in other relationships. If hub-and-spoke networks are understood as a system that collectively produces EAS through inter-firm division of labor, investing in relation-specific assets can be interpreted as an "optimization of the components [of the system] working in a particular configuration", resulting in combinations that "achieve a functionality unobtainable though combinations of more independent components" (Schilling, 2000, p. 315f). Stated in other words, the complementarity of the partners' resource endowments results in a high degree of synergistic specificity, i.e., "[t]he degree to which a system achieves greater functionality by its components being specific to one another" (Schilling, 2000, p. 316).

Regarding the assets that are generally deemed necessary in order to develop and market software products, the individuals that are involved in the production and marketing process were found to be of utmost importance, rendering software production a people business (Boehm, 1987, De Marco and Lister, 1987). More specifically and in line with the above discussion on resource complementarities, the

knowledge of the involved individuals plays a pivotal role in producing and marketing software (Robillard, 1999). This is reinforced in the EAS industry, where knowledge about both software development and business processes is needed. Thus, in the here analyzed context, relation-specific investments mainly refer to investments in relation-specific knowledge creation.

Spoke Perspective. We argue that the spokes indeed have to invest heavily in assets that are specific to the hub in order to participate in the hub's partner network and enable the access to complementary resources and capabilities as discussed in the previous paragraph. First and foremost, spokes have to invest in hub-specific knowledge accumulation in order to enable the partnership through having their solutions and resources certified by the hub. In order to get this certification, spokes have to obtain knowledge about the functioning of the hub's platform and interfaces in order to develop solutions that are compatible with all other solutions that build upon the same platform. Moreover, developers may have to prove their knowledge about the hub's technology by attending trainings and passing tests. Once the spokes have accomplished the certification, continuous investments in hub-specific technological and market-related knowledge accumulation have to be made in order to keep up with recent developments in the dynamically changing EAS industry. Thereby, it is important to consider the difference between information and know-how (Dyer and Singh, 1998). While information can be codified and stored in data bases, know-how involves knowledge that is sticky or tacit (Grimaldi and Torrisi, 2001). In order to gain access to external sticky knowledge, spokes may have to put effort and invest into the creation of absorptive capacity, i.e., "the ability of a firm to

recognize the value of new, external information, assimilate it, and apply it to commercial ends" (Cohen and Levinthal, 1990, p. 128). Moreover, in order to generate relational rents and not to be imitable by other partnerships, this ability has to be partner-specific, i.e., in the case of a singular relationship between hub and spoke, specific to a dyad of organizations (Dyer and Singh, 1998). Partnering with a hub may provide the spoke with access to certain data bases with information on technological issues. In order to gain a competitive advantage through leveraging complementary resource endowments, however, spokes may need to access know-how within the hub that is not amenable to codification, e.g. because it resides within the experience and long-time collaboration of certain individuals. Thus, further hub-specific investments into absorptive capacity and knowledge-sharing may be necessary.

Hub Perspective. While spokes invest in hub-specific knowledge creation and integration in order to gain relational rents from their partnership with the hub, the situation turns out to be different on the hub side. As mentioned above, hubs certify the compatibility and quality of the spokes' solution before entering a partnership with a spoke. Thus, hubs as well have to engage in spoke-specific investments to some extent. However, as the preceding section on resource complementarities showed, hubs benefit from the network of spokes as a whole and thus, figuratively, form a relationship with the network (reconsider figure 1). As argued above, due to the hub's striving for becoming a de facto standard, this network is especially valuable for the hub if a great number of spokes participates. Therefore, we argue that hubs aim at relational extendability, i.e., the "ability to reconfigure existing

competencies for new [interorganizational relationships]" (Bala and Venkatesh, 2007, p. 343). For instance, while spokes strive for getting access to sticky know-how through developing hub-specific absorptive capacity, we argue that hubs, instead of engaging in knowledge-sharing routines with particular spokes, may rely on codifying information regarding technological and market-related issues in order to efficiently distribute it throughout the network (Grimaldi and Torrisi, 2001). According to Bala and Venkatesh, relational extendability may result in relational rents by leading to cost effectiveness, high partner density, partnering flexibility, partnering agility, greater structural embeddedness, greater control over partners, and less resource dependency on partners. Thus, in order to generate relational rents from their multilateral 1:n relationship with the network of spokes, we argue that hubs will be reluctant to invest heavily in assets that are specific to a singular relationship with a particular spoke. Instead, hubs may mainly invest in network-specific assets in order to efficiently leverage the complementarities in their multilateral relationship with the network as a whole. Summarizing this paragraph on relation-specific asset investments, we find the following asymmetry:

Asymmetry 2: In the hub-and-spoke networks of the EAS industry, only spokes invest in relation-specific assets, while the hubs' investments are mainly network-specific.

Opportunistic Behavior

As outlined above, interorganizational arrangements can be perceived as a trade-off between the relational rents generated through combining complementary resources as well as investing in relation-specific assets on the one hand, and the transaction costs resulting from the threat of opportunistic behavior on the other hand (Dyer,

1997, Williamson, 1981). We argue that in the hub-and-spoke networks of the EAS industry, both hubs and spokes are prone to behave opportunistically to a certain extent.

Spoke Perspective. Since spokes, as discussed above, invest heavily in their relationship with a hub, they cannot easily switch to other platform vendors without loosing the majority of their up-front, hub-specific investments and being forced to re-invest into the new platform. This lock-in, however, ceteris paribus increases the hub's propensity to behave opportunistically, i.e., to exploit the spokes' lock-in situation and take advantage of opportunities at the spokes' expense (Williamson, 1975). Thus, the more spokes invest in assets that are specific to their relationship with the hub, the more these spokes are at the hub's mercy not to behave opportunistically. Based on Lavie's (2006) extension of the RBV to interorganizational arrangements, we argue that hub organizations may behave opportunistically in two important ways. First, hubs may be reluctant to share resources with a specific spoke and thus decrease the possibilities of value creation. Second, hubs may behave opportunistically and appropriate what Lavie calls "outbound spillover rent" (2006), i.e., the hub may capitalize on its dominant position by absorbing the spokes' critical knowledge. Both threats of opportunistic behavior will be analyzed subsequently.

As discussed above, spoke companies benefit from the characteristics of system competition in hub-and-spoke networks, since this system competition implies the opportunity to access external resources residing inside the hub organization that the spokes are highly dependent upon for successfully developing and marketing their

EAS. On the contrary, hubs were found to be mainly dependent on the network as a whole and not on the resources of a single spoke. The RDT as proposed by (Dyer and Singh, 1998) deals with such interorganizational dependencies. Central to this theory is the power distribution between organizational actors that results from dependencies on external resources that are beyond an organization's control. Power is perceived as the counterpart of dependence, since "the power of A over B is equal to, and based upon, the dependence of B upon A" (Emerson, 1962, p. 33). In line with the above discussion on resource complementarities, we argue that in the hub-and-spoke networks of the EAS industry, spoke organizations face a situation of considerable power imbalance.

From a RDT perspective, through participating in the partner network of a hub organization, spokes attempt to absorb the constraints posed by the limited access to required external resource. In a situation of power imbalance, however, constraint absorption is unlikely, since the dominant organization prefers maintaining the status quo of power distribution since otherwise it would lose "its bargaining power and the advantageous exchange conditions that accompany it" (Casciaro and Piskorski, 2005, p. 172). Accordingly, we argue that hubs, although fostering a partner network of spokes, are reluctant to grant unlimited access to complementary resources to singular spoke organizations. For example, although accessing the hub's global marketing channel could be considered highly beneficial for the spokes, the hub is not expected to grant this access in an unlimited way.

Second, the power imbalance in the hub-spoke relationship together with the high degree of investments in relation-specific assets performed by the spoke may lead to

knowledge spillovers. The hub may behave opportunistically and capitalize on its dominant position over the spokes by absorbing the spokes' critical knowledge that is unveiled throughout the partnership and apply it to commercial ends itself. For instance, the hub may appropriate these "outbound spillover rent" (Lavie, 2006) by imitating a spoke's functionality after getting access to the spoke's solutions' source code throughout the certification process. The reason for this may be that the hub changes its product strategy and considers functionalities that were formerly out of its scope as a part of its core competencies. For a spoke organization, the imitation of its functionality can be considered a very harmful act of opportunistic behavior, since it may dramatically jeopardize the spoke's survival.

Hub Perspective. From the perspective of hub organizations, spokes may follow their self-interest and, for instance, offer functionalities to their customers that are also covered by the hub's solution, thus ending up in a situation of competition, which may be assumed not to be in the hub's interest. Moreover, spokes may not comply with certain interface standards posed by the hub, thus decreasing the overall compatibility of the systems. However, according to TCE, opportunistic behavior in interorganizational partnerships is especially likely if the involved actors invest in partner-specific assets. The more an actor invests in assets that are specific to a certain partner, the more this actor is locked into the relationship, since ending the relationship would imply the loss of the partner-specific investment performed ex ante (Williamson, 1975). As we have shown above, hubs generally avoid investing heavily in assets that are specific to a single spoke. Therefore, we argue that hubs

only face minor threats of opportunistic behavior in a singular relationship with a spoke.

Taken together, we find that due to their dominant position and their reluctance to invest in spoke-specific assets, hubs only face minor threats of opportunistic behavior. On the contrary, the spoke organizations have to deal with the hub's potential reluctance to share resources. Furthermore, the hub may capitalize on knowledge spillovers and imitate the spokes' solutions, posing another class of opportunistic behavior. To sum up, we find

Asymmetry 3: In the hub-and-spoke networks of the EAS industry, hubs only face minor threats of opportunistic behavior on the part of the spokes, while the spokes' business model is threatened by the hubs' reluctance to share resources and the potential exploitation of knowledge spillovers.

Governance Mechanisms

Out of the four factors that enable the generation of value through interorganizational relationships proposed by Dyer and Singh (1998), the application of effective governance mechanisms plays a special role because its impact on value generation is twofold. First, from a TCE perspective, effective governance mechanisms may lower transaction costs and thus directly increase relational rents. Second, effective governance mechanism may foster the generation of relational rents by increasing the willingness of partners to engage in value creation initiatives, i.e., to combine complementary resources and to invest in relation-specific assets and knowledge-sharing mechanisms. Generally, two types of governance mechanisms may be

distinguished. Formal governance mechanisms refer to instruments that are codified by contracts, technological standards or through other formal devices that enable the partners to exercise control (like e.g. the discussed certification process). On the contrary, we understand informal governance mechanisms as implicit coordination measures that reduce the threat of opportunistic behavior like e.g. mutual adjustment based on socialization and trust (Adler, 1995, Kraut and Streeter, 1995).

Spoke Perspective. The above discussion on opportunistic behavior showed that the spokes have to deal with a considerable threat of opportunistic behavior on the part of the hub organization. This threat of opportunism consists in the hub's reluctance to share resources as well as in the threat of knowledge spillover. Dyer (1997) suggests that in the face of relation-specific investments, informal governance mechanism are better suited for impeding opportunistic behavior of a partner than formal governance mechanisms. In a similar way, considering the power imbalance between hub and spoke, Casciaro and Piskorski (2005) propose that dependent organizations engage in unilateral measures to deal with the limited access to resources resulting from power imbalance. The dependent organization is assumed to apply tactics to "restructure dependencies by aiming directly at the constraining party in the relationship" (Casciaro and Piskorski, 2005, p. 167). For instance, dependent actors may attempt to stabilize "the flow of valued resources by socializing members of the constraining organization or through the exchange of other valuable goods, such as status, friendship, or information" (Casciaro and Piskorski, 2005, p. 168). Following this point of view, we argue that while hubs behave opportunistically on a strategic and

organizational level, the governance mechanisms that act as a remedy against the threat of this opportunistic behavior can mainly be found on an individual level.

For instance, we have shown that, despite the spokes' investments in hub-specific absorptive capacity, hubs may be unwilling to grant unlimited access to their commercial, technological, and social capital. Thus, in order to actually exploit the access to external resources, spokes may rely on informal governance mechanisms. This assertion is substantiated by the findings of Yli-Renko et al. (2001), who argue that external knowledge acquisition from key customers that is found to increase firm success is positively influenced by social interaction, the quality of the relationship, and the network ties provided by this customers. We argue that Yli-Renko et al.'s results may be transferred to hub-spoke relationships in the EAS industry, holding that through informal governance mechanisms like social interaction, spokes may exploit the access to complementary resources residing within the hub organization in spite of the hub's discussed unwillingness to share resources with a specific spoke.

Furthermore, informal relationships with decision makers within the hub organization that are based on trust may prevent the hub from exploiting the spoke's know-how that is unveiled through the partnership and thus avoid an imitation of the spoke's business model, even though it might be strategically appropriate from the hub organization's point of view.

However, strategic re-orientation and pressure from a greater number of customers to offer a certain functionality (turning the market for this functionality from a niche into a large segment) may imply the necessity for the responsible individuals within the hub organization to eventually imitate the spoke's solutions in spite of the

spoke's informal relationships with hub staff. In such a situation, informal governance mechanisms may encourage the hub to share knowledge with a specific spoke that is valuable for its long-term success. For instance, hub personnel may "warn" the spoke in advance and thereby provide the spoke with more time to bring in its capability to innovate and to come up with new solutions and functionalities. Moreover, hub staff may actively provide the spoke with hints which market segments are promising and will not be addressed by the hub in the future (Uzzi, 1997, p. 45). Thus, informal governance mechanisms can be seen as a possibility for spokes both to actually exploit the gained access to external resources and to ensure future success.

Hub Perspective. In contrast to the relational governance mechanisms aimed at by the spokes, hubs may more strongly rely on formal governance mechanisms. The discussion on opportunistic behavior in the previous section showed that hubs only face minor threats of opportunism due to the low amount of spoke-specific investments and the spokes' dependence on the external resources owned by the hub. Furthermore, as the discussion on relation-specific asset investments pointed out, hubs aim at efficiently coordinating the potentially great number of spoke organization. Therefore, we expect hubs to mostly rely on formal governance through contracts, technological standards, and the mentioned certification process in order to efficiently prevent the potentially great number of spokes from behaving opportunistically.

Taken together, this discussion suggests that the formal governance mechanisms applied by the hub in order to efficiently coordinate the network of spokes may not

be sufficient for spokes in order to create relational rents and to access sticky knowledge that resides inside the hub organization. Instead, informal governance mechanisms like social interaction and trust may be necessary to gain competitive advantages through the interorganizational relationship with the hub and to develop hub-specific absorptive capacity. Summarizing the discussion on appropriate governance mechanisms, we find the following proposition.

Proposition: In the hub-and-spoke networks of the EAS industry, hubs rely on formal governance mechanism and standards to coordinate the network and to gain relational rents from the hub-network relationship. In contrast, in order to ensure long-term relational rents, spokes rely on informal governance mechanisms and the development of hub-specific absorptive capacity.

Summary

We argue that within the hub-and-spoke networks of the EAS industry, hubs and spokes pursue substantially different agendas. More specifically, we find three inter-related types of asymmetries that together explain the differential governance mechanisms applied by hubs and spokes. First, hubs benefit from complementarities with the network of spokes, whereas spokes create value through accessing external resources that reside within the hub organization. Second, in order to benefit from their respective value-generating relationship (bilateral vs. multilateral), spokes invest in hub-specific assets, whereas the hubs' investments are mainly network-specific. Third, this has significant consequences for the threat of opportunistic behavior hub and spoke are exposed to respectively. While hubs face only minor threats of opportunistic behavior, the spokes' business model may be jeopardized if

the hub is reluctant to share resources or capitalizes on knowledge spillovers. This, in turn, has consequences for the governance mechanisms hub and spoke apply. While hubs mainly rely on formal governance mechanisms, spokes seek to apply informal governance mechanisms to prevent the hub from behaving opportunistically and to gain access to sticky knowledge within the hub organization, thus exploiting the access to external, complementary resources and ensuring future success. Taken together, we argue that while hubs strive for a standardization of the partnerships with small software companies, spokes aim at relational governance and an increased uniqueness of their relationship with the hub. Figure 2 summarizes our framework.

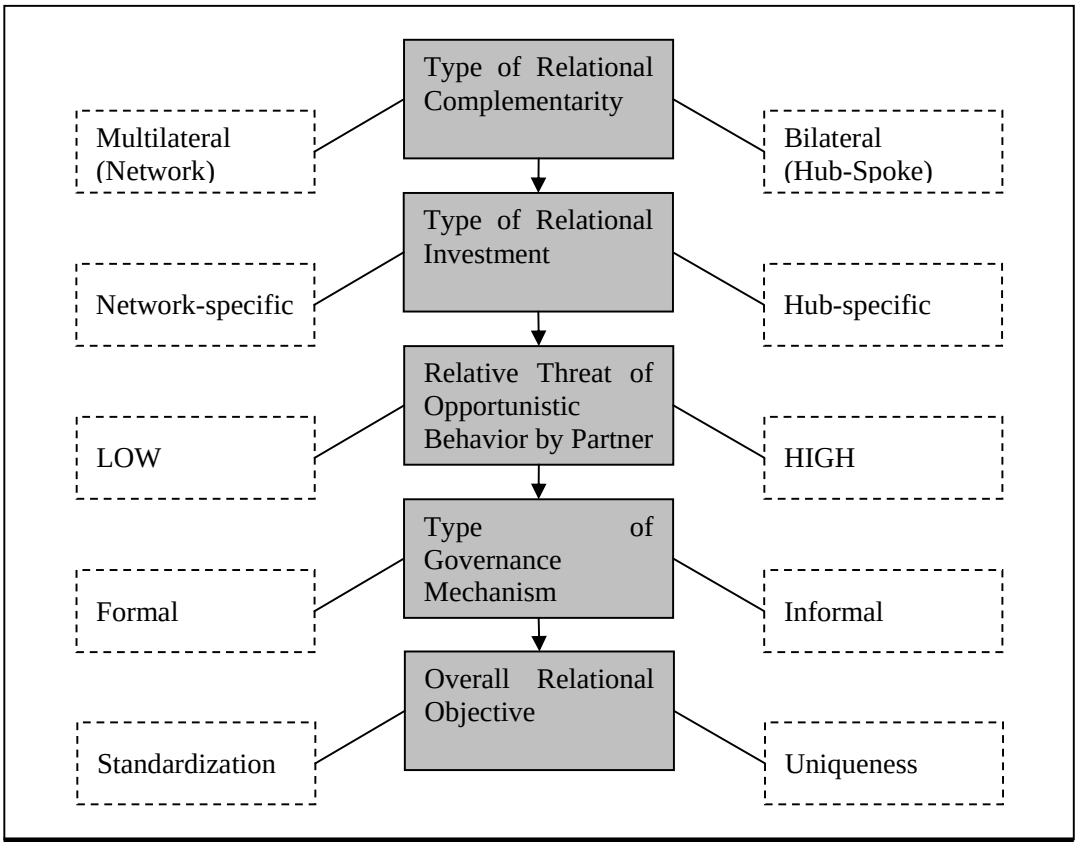

Figure 2: Theoretical Framework

Discussion

Our preceding analysis has shown that the notion of complementarity and its wider implications on partnership governance need to be re-evaluated in a new light when partnerships in hub-and-spoke networks of the EAS industry are examined. The differential roles that hub and spoke organizations play in such a network as well as the power imbalance that exists between the partners result in a chain of asymmetries. This chain of asymmetries in turn results in different types of governance mechanisms that are preferred by both parties, yet need to be aligned in order to achieve mutual benefits from the partnership.

Our theoretical analysis shows that spokes strive for 1:1-complementarity with the hub, while the hub strives for 1:n-complementary with all of its spokes. Therefore, in line with the relational view (Dyer and Singh, 1998), the spokes seek to tighten their relationship with the hub through relation-specific investments. These investments are the basis for achieving a comparative advantage over their competitors. By contrast, the hub seeks to invest into network resources that enable economies of scale and scope in network management, i.e., hubs strive for relational extendabilty. Accordingly, the consequences of opportunistic behavior are more severe for spokes than for the hubs. Paradoxically, the only way for the spokes to avoid opportunistic behavior of the hub is to invest even more in relation-specific assets, e.g. through building up social relationships and mutual trust with hub personnel. Thus, the spoke would favor informal governance. By contrast, the hub would seek to increase its network investments and thus foster formal governance, e.g. through establishing formal procedures on how the spokes' solutions can be certified. Hence, contrary to

the findings of Bala and Venkatesh (1998) who argue that an increased relational extendability generally results in relational rents for the partnering organizations, we showed that in the context of this study, relational extendability creates relational rents only for the hub organization in its relationship with the network as a whole. Spokes, in contrast, aim at increasing the uniqueness of their relationship with the hub, i.e. the relational specificity (Bala and Venkatesh, 2007). Thereby, spokes may thwart the hub's plan to create value from their multilateral relationship with the network of spokes through efficiently coordinating the dyadic relationships.

Managerial Implications. By incorporating this tension into our research model, our study has several important managerial implications for organizations in the EAS industry. Hub organizations may learn from our findings and dispense with a mainly efficiency-driven view. In order to be successful in the system competition with other networks in the long run, hubs have to find a reasonable balance between efficiently coordinating the network and satisfying the singular spokes. As we have shown, the spokes strive for relational specificity on an individual level, engaging in personal ties with hub staff. This implies that for the hub organization, it may be more reasonable to systematically install a certain degree of relational governance that complements the formal governance through standards and certification (Poppo and Zenger, 2002), instead of letting the coordination through personal ties blossom in an uncontrollable way. As a lesson learned from our study, the ideal goal of hub organizations should be to enable a "mass customization" of the governance in their partner networks, i.e., to efficiently satisfy the spokes' desire for relational

governance. Improved technological solutions for collaboration like, e.g., web 2.0 technologies, may be a possible way towards such a “mass customization”.

Spokes, on the other hand, were found to aim at informally governing their relationship with the hub. We argue that informal ties on a personal level may indeed be beneficial for spokes to get access to external technological, commercial, and social capital. However, spokes may face the problem that sociologists refer to as overembeddedness (Uzzi, 1997), i.e., by, at least in the short run, successfully relying on strong personal ties, spokes may miss to develop their own technological, commercial, and social capital. If the personal network ceases to exist, e.g. due to job fluctuation, spokes may eventually be penalized. Generally, the scenario that the spokes face resembles a classical prisoners’ dilemma. If one spoke leverages personal ties and thereby undercuts the standard coordination mechanisms, it may be beneficial for this spoke. If all spokes do so, however, the whole network and thus its participators may eventually lose ground in the system competition with other networks that coordinate the relationships more efficiently.

Theoretical Implications. Apart from these practical implications, our study makes important theoretical contributions. First, we complement existing work on the link between complementarities in the software stack and the success of interorganizational arrangements. Instead of analyzing the influence of complementarity on success on a high level, we focused on the alignment of the governance mechanisms with the type of complementarity. Regarding the differential types of complementarity, we added to previous studies by considering not only technological resources, but also the partners’ endowments with commercial and

social capital. Moreover, we differentiate the complementarities of the hub with the network as a whole as well as with a specific spoke. As such, we find that the type of complementarity – bilateral (1:1) versus multilateral (1:n) – heavily influences the applied governance mechanisms. Second, we apply the relational view as proposed by Dyer and Singh (1998) to the scenario of firm imbalance in hub-and-spoke networks of the EAS industry. The relational view holds that both partners to an exchange have to invest in relation-specific assets in order to leverage complementary resource-endowments. On the contrary, the emergence of partner networks in the EAS industry where only spokes invest in assets that are specific to the relationship with the hub shows that this does not necessarily have to be the case.

As a direct consequence of the differences between hub and spoke regarding relation-specific asset investments, spokes apply informal governance mechanisms with the goal of value creation in their relationship with the hub, while the hub strives for generating value through the network as a whole. Due to these differing value propositions in hub-and-spoke networks, the role of value appropriation, as highlighted by Lavie (2007), is of less importance. Other than in more closely tight strategic alliances, where partners work together to achieve a common outcome, the value of hub and spoke results from leveraging resources and products of each other.

Limitations and Future Research. One of the main limitations of our theoretical framework is its static nature, which takes power imbalance between dominant hubs and small spokes as a matter of fact. This view neglects that the power distribution between hub and spoke may change over time and eventually turn into a situation of mutual dependence (Casciaro and Piskorski, 2005). Ahuja (2000) mentions radical

innovations that mark discontinuities in the technical progress as an opportunity for new entrants to develop significant resources. In a similar way, the spoke may achieve a situation of mutual dependence through developing special commercial or social capital, e.g., if a former unimportant customer base turns into a key segment. Such an increase in technological, commercial, or social capital that is complementary to the hub's resources may turn the bilateral partnership between a hub and a spoke into a source of value for the hub. If the synergistic specificity of hub's and spoke's resources is high, the hub may decide to merge with or acquire the spoke organization in order to internalize the benefits that result from this synergistic specificity and absorb the constraints posed by the emerging power of the spoke[4]. Although the small size of spoke organizations and their oftentimes relatively short period of existence may render it difficult for the majority of spokes to develop resources the hub organization is indeed dependent upon (Wernerfelt, 1984), considering the possibility that spokes may become more powerful over time could be a promising theme for future research. Specifically, future research could take a dynamic process view and analyze the lifecycle of partnerships between hubs and spokes (Smith Ring and Van de Ven, 1994).

As discussed above, the asymmetry in relationship specific investments between hub and spoke translates into opposing governance mechanisms which may threaten the stability of the partnership in the long run. This discrepancy calls for future research

[4] Such a situation of merging with or being acquired by the hub may actually be in the interest of many spokes.

on mediating governance modes that help balancing out the preferences for informal (spoke) versus formal (hub) governance. To this end, it may be interesting to examine the role of ICT tools for collaboration as a mediating mechanism. Such a collaboration platform would allow the hub to address the needs of multiple spokes simultaneously, while still accounting for the requirements of particular spokes through 1:1 collaboration. The concept of communities of practice (CoP) may be transferred to this scenario, where multiple CoPs would possibly coexist in the hub-and-spoke network (Gongla and Rizzuto, 2001).

Furthermore, future research may draw on our theoretical insights in further analyzing and empirically validating both the existence of the proposed asymmetries between hubs and spokes as well as the causal relationship between resource complementarities, relation-specific asset investments, the threat of opportunistic behavior, and appropriate governance mechanisms. In order to obtain a more powerful explanatory model, the causal links suggested in figure 1 may be enriched by considering the consequences and interrelations of the complementarity of the technological, commercial, and social capital on governance mechanisms in more detail. As another promising theme for future work, we call for an in-depth analysis of the informal governance mechanisms applied by the spokes. While our study addressed informal governance mechanisms in a general way and mentioned e.g. socialization and trust, future research may examine in more detail which, when, and how informal governance mechanisms are actually applied. Moreover, it may be fruitful to include the success of the dyadic partnerships between hubs and spokes from the hubs', the spokes', the dyadic, and the network perspective into a

comprehensive research model. Such an enhanced research model would explain the impact of complementarities on partnership success. However, we argue that the incorporation of governance mechanisms as a mediator of this link may result in a research model with increased explanatory power.

References

Adler, P. S. (1995) "Interdepartmental Interdependence and Coordination: The Case of the Design/Manufacturing Interface," *Organization Science* (6) 2, pp. 147-167.

Ahuja, G. (2000) "The Duality of Collaboration: Inducements and Opportunities in the Formation of Interfirm Linkages," *Strategic Management Journal* (21) 3, pp. 317 - 343.

Amit, R. and P. J. H. Schoemaker (1993) "Strategic Assets and Organizational Rent," *Strategic Management Journal* (14) 1, pp. 33 - 46.

Bala, H. and V. Venkatesh (2007) "Assimilation of Interorganizational Business Process Standards," *Information Systems Research* (18) 3, pp. 340 - 340.

Baldwin, C. Y. and B. Clark (1997) "Managing in an Age of Modularity," *Harvard Business Review* (75) 5, pp. 84 - 93.

Barney, J. B. (1991) "Firm Resources and Sustained Competitive Advantage," *Journal of Management* (17) 1, pp. 99 - 120.

Boehm, B. W. (1987) "Improving Software Productivity," *IEEE Computer* (20) 9, pp. 43 - 57.

Bresnahan, T. F. and S. Greenstein (1999) "Technological Competition and the Structure of the Computer Industry," *The Journal of Industrial Economics* (47) 1, pp. 1 - 40.

Campbell-Kelly, M. (2003) From Airline Reservation to Sonic the Hedgehog: A History of the Software Industry. Cambridge, USA: The MIT Press.

Casciaro, T. and M. J. Piskorski (2005) "Power Imbalance, Mutual Dependence, and Constraint Absorption: A Closer Look at Resource Dependence Theory," *Adminisatrative Science Quarterly* (50) 2, pp. 167 - 199.

Coase, R. H. (1937) "The Nature of the Firm," *Economica* (4) November, pp. 386 - 405.

Cohen, W. M. and D. A. Levinthal (1990) "Absorptive Capacity: A New Perspective on Learning and Innovation," *Administrative Science Quarterly* (35) 1, pp. 128 - 152.

Conway, M. E. (1968) "How do Committees Invent?," *Datamation* (14) 4, pp. 28 - 31.

Das, T. K. and B.-S. Teng (2000) "A Resource-Based Theory of Strategic Alliances," *Journal of Management* (26) 1, pp. 31 - 61.

De Marco, T. and T. Lister (1987) *Peopleware*. New York: Dorset House Publishing.

Dierickx, I. and K. Cool (1989) "Asset Stock Accumulation and Sustainability of Competitive Advantage," *Management Science* (35) 12, pp. 1504 - 1511.

Dyer, J. H. (1997) "Effective Interfirm Collaboration: How Firms Minimize Transaction Costs and Maximize Transaction Value," *Strategic Management Journal* (18) 7, pp. 535 - 556.

Dyer, J. H. and H. Singh (1998) "The Relational View: Cooperative Strategy and Sources of Interorganizational Competitive Advantage," *The Academy of Management Review* (23) 4, pp. 660 - 679.

Eisenhardt, K. M. and C. B. Schoonhoven (1996) "Resource-Based View of Strategic Alliance Formation: Strategic and Social Effects in Entrepreneurial Firms," *Organization Science* (7) 2, pp. 136 - 150.

Emerson, R. M. (1962) "Power-Dependence Relations," *American Sociological Review* (27) 1, pp. 31 - 41.

Farrell, J., H. K. Monroe, and G. Saloner (1998) "The Vertical Organization of Industry: System Competition versus Component Competition," *Journal of Economics and Management Strategy* (7) 2, pp. 143 - 182.

Gao, L. S. and B. Iyer (2006) "Analyzing Complementarities Using Software Stacks for Software Industry Acquisitions," *Journal of Management Information Systems* (23) 2, pp. 119 - 147.

Gao, L. S. and B. Iyer. (2008) "Partnerships between Software Firms: Is There Value from Complementarities?" Proceedings of the Proceedings of the 41st Annual Hawaii International Conference on System Sciences (HICSS 2008), Hawaii, 2008.

Gawer, A. and M. A. Cusumano (2002) *Platform Leadership*. Cambridge, MA: Harvard Business School Press.

Gongla, P. and C. R. Rizzuto (2001) "Evolving Communities of Practice," *IBM Systems Journal* (40) 4, pp. 842-862.

Grimaldi, R. and S. Torrisi (2001) "Codified-tacit and general-specific knowledge in the division of labour among firms A study of the software industry," *Research Policy* (30) 9, pp. 1425 - 1442.

Henderson, R. and K. B. Clark (1990) "Architectural Innovation: The Reconfiguration of Existing Product Technologies and the Failure of Established Firms," *Administrative Science Quarterly* (35) 1, pp. 9 - 30.

Hoetker, G. (2006) "Do Modular Products Lead to Modular Organizations?," *Strategic Management Journal* (27) 6, pp. 501 - 518.

Iansiti, M. and R. Levien (2004) The Keystone Advantage: What the New Dynamics of Business Ecosystems Mean for Strategy, Innovation, and Sustainability. Boston, MA: Harvard Business School Press.

Jarillo, J. C. (1988) "On Strategic Networks," *Strategic Management Journal* (9) 1, pp. 31 - 41.

Kraut, R. E. and L. A. Streeter (1995) "Coordination in Software Development," *Communications of the ACM* (38) 3, pp. 69 - 81.

Lavie, D. (2006) "The Competitive Advantage of Interconnected Firms: An Extension of the Resource-Based View," *Academy of Management Review* (31) 3, pp. 638 - 658.

Lavie, D. (2007) "Alliance Portfolios and Firm Performance: A Study of Value Creation and Appropriation in the US Software Industry," *Strategic Management Journal* (28) 12, pp. 1187-1212.

Messerschmitt, D. G. and C. Szyperski (2003) *Software Ecosystem - Understanding an Indispensable Technology and Industry*. Cambridge, USA: The MIT Press.

Milgrom, P. and J. Roberts (1995) "Complementarities and Fit: Strategy, Structure and Organizational Change in Manufacturing," *Journal of Accounting and Economics* (19) 2-3, pp. 179 - 208.
Nalebuff, B. and A. M. Brandenburger (1997) *Co-opetition*. London, UK: HarperCollins Publishers.
Pfeffer, J. and G. R. Salancik (1978) The External Control of Organizations: A Resource Dependence Perspective. New York: Harper & Row.
Poppo, L. and T. Zenger (2002) "Do formal contracts and relational governance function as substitutes or complements?," *Strategic Management Journal* (23) 8, pp. 707 - 725.
Prencipe, A. (2003) "Corporate Strategy and Systems Integration Capabilities: Managing Networks in Complex Systems Industries.," in A. Prencipe, A. Davies, and M. Hobday (Eds.) *The Business of Systems Integration*, Oxford: Oxford University Press, pp. 114 - 132.
Robillard, P. N. (1999) "The role of knowledge in software development," *Communications of the ACM* (42) 1, pp. 87 - 92.
Rothaermel, F. T. (2001) "Research note: Incumbent's Advantage Through Exploiting Complementary Assets via Interfirm Cooperation," *Strategic Management Journal* (22) 6-7, pp. 687-699.
Schilling, M. A. (2000) "Towards a General Modular Systems Theory and its Application to Interfirm Product Modularity," *Acedemy of Management Review* (25) 2, pp. 312 - 334.
Schilling, M. A. and H. K. Steensma (2001) "The Use of Modular Organizational Forms: An Industry-Level Analysis," *The Academy of Management Journal* (44) 6, pp. 1149 - 1168.
Shapiro, C. and H. R. Varian (1999) *Information Rules - A Strategic Guide to the Network Economy*. Boston, MA: Harvard Business School Press.
Smith Ring, P. and A. H. Van de Ven (1994) "Development of Processes of Cooperative Interorganizational Relationships," *Academy of Management Review* (19) 1, pp. 90-118.
Teece, D. J., G. Pisano, and A. Shuen (1997) "Dynamic Capabilities and Strategic Management," *Strategic Management Journal* (18) 7, pp. 509 - 533.
Uzzi, B. (1997) "Social Structure and Competition in Inter-Firm Networks: The paradox of embeddedness," *Adminisatrative Science Quarterly* (42) 1, pp. 35 - 67.
Welsh, J. A. and J. F. White (1981) "A Small Business is not a Little Big Business," *Harvard Business Review* (59) 4, pp. 18 - 27.
Wernerfelt, B. (1984) "A Resource-based View of the Firm," *Strategic Management Journal* (5) 2, pp. 171 - 180.
Williamson, O. E. (1975) Markets and Hierarchies, Analysis and Antitrust Implications : A Study in the Economics of Internal Organization. New York: Free Press.
Williamson, O. E. (1981) "The Economics of Organization: The Transaction Cost Approach," *American Journal of Sociology* (87) 3, pp. 548-577.

Williamson, O. E. (1990) “Transaction Cost Economics,” in R. Schmalensee and R. D. Willig (Eds.) *Handbook of Industrial Organization*, Amsterdam, New York, Oxford, Tokyo, pp. 135-182.

Yli-Renko, H., E. Autio, and H. J. Sapienza (2001) "Social capital, knowledge acquisition, and knowledge exploitation in young technology-based firms," *Strategic Management Journal* (22) 6/7, pp. 587-613.

Zajac, E. J. and C. P. Olsen (1993) "From Transaction Cost to Transactional Value Analysis: Implications for the Study of Interorganizational Strategies," *Journal of Management Studies* (30) 1, pp. 131 - 145.

芽|Sprouts

Working Papers on Information Systems | ISSN 1535-6078

Office:
Sprouts
University of Amsterdam
Roetersstraat 11, Room E 2.74
1018 WB Amsterdam, Netherlands
Email: admin@sprouts.aisnet.org

芽|Sprouts